

## CLAIMS

1. A hollow carbon nanoballoon structure comprising graphite sheets linked to form a curved surface and having a diameter of 20 to 500 nm, the diameter being a value obtained by averaging a length of the structure in a direction of an X-axis passing through a center of the structure and a length of the structure in a Y-axis direction passing through the center and perpendicularly intersecting the X-axis.
2. The carbon nanoballoon structure according to claim 1, wherein the number of the graphite sheets is 1 to 30.
3. The carbon nanoballoon structure according to claim 1 or 2, having a void content of 30 to 99%, the void content being determined by calculating the diameter of the structure by averaging the length of the structure in the direction of the X-axis passing through the center of the structure and the length of the structure in the direction of the Y-axis passing through the center and perpendicularly intersecting the X-axis, approximating the volume of the structure as a sphere, calculating the diameter of the hollow portion by subtracting a value twice the thickness of the graphite sheet (graphene) from the diameter of the structure, approximating the volume of the hollow portion as a sphere, and calculating  $(\text{volume of the hollow portion} / \text{volume of the structure}) \times 100\%$ .
4. The carbon nanoballoon structure according to any of claims 1 to 3, wherein an opening reaching the hollow portion is formed in the structure.
5. A method of producing the carbon nanoballoon structure according to any of claims 1 to 3, comprising heating soot prepared by arc discharge using carbon

electrodes, soot prepared by vaporizing carbon by laser irradiation (ablation), or carbon black having a specific surface area of 1000 m<sup>2</sup>/g or more and a primary particle diameter of 20 nm or more at a high temperature in an inert gas atmosphere.

- 5 6. The method according to claim 5, wherein the arc discharge using the carbon electrodes or the laser irradiation of carbon is performed in a nitrogen atmosphere, an oxygen atmosphere, a hydrogen atmosphere, or a mixed atmosphere of two or more gases selected from nitrogen, oxygen, and hydrogen, and the resulting soot partially includes a carbon nanohorn.

10

7. An electron emitter which emits electrons upon application of an electric field between an extractor electrode and a cathode electrode positioned close to the extractor electrode and including an emitter material, the emitter material including the carbon nanoballoon structure according to any of claims 1 to 3.

15